Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
	)	
Implementation of Section 6002(b) of the Omnibus Budget Reconciliation Act of 1993	)	WT Docket No. 13-135
	)	
	)	
Annual Report and Analysis of Competitive Market Conditions With Respect to Mobile Wireless, including Commercial Mobile Services	)	
	)	

Reply Comments of Information Age Economics

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Summary

These Reply Comments by Information Age Economics (IAE) focus on four significant topics for consideration in the review and assessment of competitive conditions in the U.S. market for commercial mobile wireless services (CMWS). The analyses or Comments in this Docket associated with these topics that have been submitted by Verizon, AT&T and CTIA (Cellular Telecommunications & Internet Association) include examples of fundamental errors of facts and omission of critical evidence that contradict and invalidate their findings of, and assertions about, the presence of effective competition in this market.

There are also errors of omission and commission that invalidate the findings of the superior performance of the U.S. mobile market compared to other countries.

The four topics and examples of the sources of misrepresentations are:

1. The misleading comparison of the relative performance of mobile wireless markets in the European Union and the U.S. and the alleged superiority of the U.S. as presented in a report by Navigant Economics[1] that is referenced in Comments in this Docket by the CTIA (which reproduces the Navigant report in its entirety) as well as by AT&T and Verizon.
2. The continued use by the CTIA of a metric of spectrum efficiency to compare operators and mobile sectors in selected countries despite multiple documented demonstrations, including but not limited to previous filings with the Commission[2], that this metric is spurious, misleading and meaningless in the context of cellular network architectures.

[1] Navigant Economics, "Mobile Wireless Performance in the EU & the US," http://www.gsmamobilewirelessperformance.com/GSMA_Mobile_Wireless_Performance_May2013.pdf

[2] Comments of AT&T Inc, http://apps.fcc.gov/ecfs/document/view?id=7520920063; Comments of Verizon Wireless, http://apps.fcc.gov/ecfs/document/view?id=7520920023; Comments of CTIA, http://apps.fcc.gov/ecfs/document/view?id=7520920372

3. The harm to customers, competition and the public interest already caused by non-interoperability in the key 700 MHz band, that will soon be greatly amplified by the substantial planned expansion of non-interoperability in the near future in the LTE networks of both Verizon and AT&T, the two largest and most powerful wireless and wireline companies in the U.S.
4. The unjustified assertion by AT&T with respect to the equivalence of, or substitutability between, low (sub 1 GHz) and high frequencies for mobile network deployments, even in terms of their respective costs to provide coverage in rural areas, and related statements by AT&T and Verizon opposing the imposition of any limits on the shares and amounts of total sub 1 GHz spectrum they should be allowed to accumulate.

The findings of errors of commission and omission that IAE presents in these Reply Comments demonstrate that the U.S. CMWS market is not effectively competitive today. Furthermore, absent decisive action to reverse current trends this market is proceeding along a path to become less competitive over the course of the next few years, with the likely result that the U.S. will fall behind in performance compared to other developed countries with more pro-competitive policies and market structures.

The depth and variety of the misrepresentations and omissions of critical evidence identified in this subset of issues call into question the credibility of **all** the recommendations, claims, and assertions contained in the filings by Verizon and AT&T in this FCC Docket, as well as in others such as but not limited to 12-69, 12-268, and 12-269.

Introduction

Information Age Economics believes that it is critical for the promotion and protection of the public interest and the future of competition in the U.S. broadband market (fixed and mobile) to bring the full set of issues covered in these Reply Comments to the attention of the FCC, although several of them have already been addressed in other filings that we have submitted to the Commission, most recently in Dockets 12-69, 12-268, and 12-269, and earlier in Docket 12-4. Several of these IAE filings are referenced in this document. We describe the connections between these issues, i.e., their cumulative and mutually reinforcing impact, and supplement our earlier analyses based on our further and ongoing research.

These topics do not encompass an exhaustive set of the errors of fact and omissions of critical evidence that characterize the filings of Verizon, AT&T and the CTIA in this and other FCC Dockets. But they do demonstrate with enough examples that in their claims and assertions these organizations exhibit a consistent careless indifference to fundamental realities of network engineering as well as to data on matters such as the prices and performance of broadband services available around the world. Hence their assessments of competitive market conditions with respect to commercial mobile wireless services in the U.S. lack credibility.

The contents of this IAE filing contain several striking and disturbing examples of fundamental errors in the "facts" and analyses as well as examples of the perverse aspects of the perspectives presented by the two largest U.S. operators in support of their recommendations for policies

and regulations in the U.S. mobile sector. In both letter and spirit these examples violate the principles behind and the conditions required of inputs to informed public discussion and debate of critical issues that can make a major contribution to the FCC and its stated desire for decisions driven by facts and data.

We trust that organizations whose business interests will clearly suffer directly if the anti-competitive, customer-hostile policies proposed by Verizon, AT&T, the CTIA, and their commissioned studies, are enacted, as well as other less directly affected stakeholders, will take up, buttress and expand the evidence that we have developed.

We recommend and would welcome an in-depth and independent analysis by the FCC's legal, technical, and economic staff to build a comprehensive fact-based evaluation of the anti-competitive strategies and tactics pursued by the two largest U.S. mobile operators.

The Comparative Performance of the U.S. Mobile Sector

There are many statements from Verizon (including in its Comments filed in this Docket 13-135), AT&T and the CTIA touting the leadership of the U.S. in LTE subscriber numbers as evidence of this country's and their success in mobile communications. In absolute quantitative terms these statements are true and presumably will remain so, given that the U.S. is the word's third most populous nation, until LTE is introduced and takes off in China and India.

However, in terms of penetration (LTE subscriptions per head of population) IAE estimates that, as of end Q1 2013, South Korea stood at almost 41%, while the U.S. was at about 13-15%. This position of South Korea is even more remarkable if, at least according to the CTIA's own metric, as discussed below, it is operating with a spectrum efficiency of less than one third that of the U.S. with only 270 MHz of spectrum assigned for CMWS compared to over 470 MHz in the U.S.

One measure where the U.S. may be destined to retain global leadership, if Verizon and AT&T have their way, is in the number of non-interoperable mobile devices (see below). Only Canada and a few Caribbean islands are on a path to adopt the non-interoperable 700 MHz band plan. Latin America including Mexico, which for the most part has traditionally followed U.S. band plans, is adopting the INTEROPERABLE Asian band plan at 700 MHz.

Misleading Representations of Europe and the U.S.

A recently published report, commissioned by the GSM Association, and produced by Navigant Economics (footnote 1) is being cited on both sides of the Atlantic as evidence that the U.S. has been on the right path, and has achieved superiority in the performance of its mobile market, e.g., with respect to the speeds, costs and coverage of mobile broadband services, compared to other countries. In the U.S. the report is being used, as in the CTIA's, Verizon's and AT&T's Comments in this Docket, to justify their claims of the effectiveness of competition in the U.S. CMWS market.

However, the Navigant Report is flawed by errors of commission and of omission, e.g., it ignores any mention of the adverse consequences of non-interoperability in the U.S. LTE landscape that is for now unique to the U.S. and is not expected to spread to other countries with minor

exceptions (see the discussion below). The Navigant analysis also fails to discuss the implications for competition and customers of the effective control by just one operator – Sprint -- of the valuable 2.5 GHz band which will have a unique role to play in the future global LTE landscape by virtue of the harmonization of its allocation across many countries in all three ITU (International Telecommunication Union) regions and the amount of bandwidth it includes (190 MHz).

Both of these exceptional characteristics of the U.S. mobile market (non-interoperability and effective control of the 2.5 GHz band in the hands of just one operator) are problematic in terms of their impact on customers' freedom of choice, international roaming possibilities for U.S. customers when abroad and also for visitors to the U.S., as well as the extent and timing with which LTE networks are deployed at 2.5 GHz frequencies. In other countries several competing operators hold or are able to acquire 2.5 GHz spectrum licenses, with the result that this band is likely to be exploited more extensively than in the U.S. where deployments are driven by the plans and schedule of only one operator.

The value of 2.5 GHz frequencies will increase in the near future since their propagation characteristics -- the disadvantage of a short range (so coverage of rural areas is relatively expensive) and limited though-wall penetration (so in-building coverage provided by external base stations is relatively poor) -- are an advantage (lower risk of inter-cell interference) for the many small cell deployments underway and being planned by operators around the world. Small cells are key to operators' efforts to "densify" their networks in order to handle rapidly rising traffic volumes in congested dense urban areas and locations such as airports, malls and sports stadiums.

Errors of commission in the Navigant Economics report have also been identified and documented in a presentation from a European source that accompanies this filing[3]. The findings and assertions contained in the Navigant Economics study are invalid. Their inclusion with the approval in the Comments of the CTIA, Verizon and AT&T discredits these operators' positions that there is effective competition in the U.S. CMWS market today and that it will continue to flourish if their recommendations are followed.

Measures of Spectrum Efficiency

On multiple occasions IAE has demonstrated the spurious nature of the metric of spectrum efficiency used by the CTIA, and others, e.g., Verizon, to support their claim of the superior performance of the U.S. mobile sector, and by implication of the achievements of its two largest operators, Verizon and AT&T[4].

Nevertheless, the CTIA repeats and presents an updated (to end-2012) version of this erroneous metric in Comments filed in this Docket. The CTIA's persistence in the use of this metric and its

[3] Antonios Drossos, Rewheel (Finland), "Mobile market competitiveness disparities in EU27**,"** ECTA 'Single Market for Telecoms' conference Brussels 25 June 2013 - see especially p.6.

[4] Martyn Roetter and Alan Pearce, "The Mystery of the Spurious Spectrum Efficiency Metric: Why Are America's Wireless Leaders Promoting a Meaningless Measure?" Bloomberg BNA, Daily Report for Executives, May 31, 2013 (a copy of this article is included with this filing); and "IAE Addendum to *ex parte* meeting," May 29, 2012, http://apps.fcc.gov/ecfs/document/view?id=7021920798

refusal to acknowledge the need for the development of a metric of spectrum efficiency that would be widely acceptable as having probative value, adds to the need for the FCC to take immediate action in order to engage ALL interested parties in a public, honest, data-based debate on these critical issues confronting the U.S. mobile sector.

Possible Foreign Reaction to Spurious U.S. Claims of Superiority

We have sent a copy of the CTIA's flag chart of national spectrum efficiencies (Appendix A) to the GSM Association in Europe, and to representatives of the European Commission, to see if it inspires Europeans to greater effort to close the large alleged gaps in the efficiency with which they use spectrum compared to Americans. No doubt this "finding" will be a shock to Deutsche Telekom, the parent of T-Mobile USA and to U.K.-based Vodafone, the partner of Verizon in Verizon Wireless. In contrast, China Mobile might be pleased in reading IAE's extension of the CTIA table, in the references cited in footnote 4 to include other countries, to discover that it is over three times more spectrally efficient than Verizon Wireless, according to this metric, while Indian operators might be delighted to learn how far ahead they are of their Japanese counterparts along this dimension of "operating efficiency".

Consequences of Non-Interoperability in LTE Deployments

The consequences of non-interoperability in LTE networks introduced by AT&T and Verizon after the 700 MHz auction in 2008 have been analyzed exhaustively in recent years, in particular in FCC Docket 12-69, as well as in other Dockets involving major spectrum transactions. The adverse consequences of non-interoperability lie in the resulting limitations for roaming opportunities (national and international) and the higher barriers (or costs) for subscribers to switch between service providers, as well in the implications for reduced economies of scale and delays for smaller operators in the development of devices for their 700 MHz networks.[5]

Non-Interoperability Will Soon Become Permanent and Pervasive

Non-interoperability was introduced unilaterally and surreptitiously[6] into the U.S. through an initiative taken at the global LTE standards body the 3GPP to define an AT&T-unique Band Class 17 in the Lower 700 MHz band. For its part Verizon violated the 700 MHz open access rules

[5] See for example the IAE filings: http://apps.fcc.gov/ecfs/document/view?id=7021985417; http://apps.fcc.gov/ecfs/document/view?id=7022017276; http://apps.fcc.gov/ecfs/document/view?id=7021920798; http://apps.fcc.gov/ecfs/document/view?id=7022003838; http://apps.fcc.gov/ecfs/document/view?id=7021920798; as well as: "Non-Interoperability at 700 MHz: Lower Revenues & Higher Prices," https://competitivecarriers.org/wp-content/uploads/2011/11/RCA-700MHz-Interoperability-FNL.pdf

[6] To the best of our knowledge at that time in 2008 no U.S. operators other than AT&T and Verizon who had acquired 700 MHz licenses were represented at the 3GPP or took part in the development of Band Class 17 – nor did the FCC.

applied to the Upper 700 MHz Band C block licenses it acquired in 2008[7], for which it has been fined.

The situation today is that, as IAE forecast, the number of non-interoperable LTE devices in service in the U.S. exceeded 30 million by the end of 2012. Furthermore the impact of non-interoperability, and the harm it causes, is about to become embedded throughout the entire LTE landscape as a result of the plans of Verizon and AT&T to introduce inter-band carrier aggregation, including non-interoperable 700 MHz deployments, in the deployment of LTE-Advanced and to offer LTE-only devices to subscribers[8].

AT&T continues to resist efforts to establish an interoperability mandate on the grounds that the costs it would incur to fulfill it are huge and the alleged problems that necessitate non-interoperability have not been resolved. At the same time, like Verizon, AT&T is planning to expand non-interoperability through its introduction of inter-band carrier aggregation and imminent nationwide LTE coverage to establish facts on the ground (or in the airwaves) to ensure that it becomes a permanent, pervasive and unique (except for Canada and the Caribbean) feature of the LTE environment in the U.S. This prospect is particularly disturbing in light of one forecast that LTE will account for 70% of all U.S. mobile subscriptions as soon as 2017[9].

The sheer scale of non-interoperability will soon reach the point that the U.S. mobile market may in effect operate as three separate "countries" (although geographically intertwined and with a shared set of numbers) for mobile communications, namely "Verizona," "ATTania", and "The Otherlands." Customers will encounter increased switching costs and inconvenience if they wish to change their mobile service provider from one "country" to another. This cannot and should not be tolerated by the FCC and the U.S. Congress, the guardians of the nation's spectrum that have imposed a mandatory obligation that licensed operators must act in the public interest, convenience and necessity, on an equal, non-discriminatory, non- preferential basis.

Spectrum Aggregation and the Roles of Low and High Band Frequencies

The issue of whether there should be any limits, and if so what they should be, on how much spectrum any one operator can accumulate overall and/or within sub 1 GHz bands has become an urgent topic in the context of secondary market transactions for spectrum licenses, and the rules for the auction of new spectrum, most notably in the context of the planned Incentive Auctions of 600 MHz frequencies.

The Department of Justice (DOJ) has contributed to the ongoing debate with a position in favor of limits on sub 1 GHz spectrum aggregations. The DOJ's position has been attacked by AT&T

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[7] http://news.cnet.com/8301-13578_3-57484000-38/verizon-to-pay-$1.25m-fcc-fine-forced-to-allow-tethering-apps/

[8] http://www.fiercewireless.com/story/analyst-att-launch-lte-advanced-second-half-2013/2012-12-04; http://www.pcmag.com/article2/0,2817,2421046,00.asp; http://news.cnet.com/8301-1035_3-57591213-94/verizon-says-first-lte-only-phones-to-arrive-in-late-2014/

[9] http://www.fiercewireless.com/story/report-us-lte-subscribers-will-make-70-connections-2017/2013-06-11

and Verizon, and in "studies" that they have commissioned, as well as by other studies whose sources of support are not clear.

A specific controversy linked to the Incentive Auctions is whether an unrestricted concentration of spectrum holdings in sub 1 GHz bands alone should be allowed, or whether bidding eligibility restrictions should be imposed on Verizon and AT&T, who partly through legacy licenses hold the great majority of existing sub 1 GHz licenses in the U.S. [10]

The case for limiting the sub 1 GHz holdings of any one operator is based on the propagation characteristics of low band frequencies (longer range and better in-building penetration than high band frequencies) that convey a formidable economic and operational advantage to operators that hold both low and high band licenses compared to those (like T-Mobile and Sprint) who have access to no or only very limited low band frequencies[11].

The dangers or inevitable anti-competitive consequences of excessive spectrum concentration, and of lopsided accumulations of sub 1 GHz band licenses, are laid out in filings by the DOJ and Professor Jonathan Baker.[12] Research undertaken by IAE has produced evidence that supports their findings, notably with respect to the compelling justification for imposing spectrum aggregation limits on operators' sub 1 GHz license holdings on pro-competitive grounds.[13]

In contrast, other filings submitted to the FCC argue that imposing any restrictions on Verizon and AT&T with respect to their spectrum holdings is unjustified and will have harmful consequences economically (specifically the value generated by the use of spectrum) and in terms of employment[14]. The first of the filings cited in footnote 14 ("Economists Submissions")

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[10] These sub 1 GHz licenses are in the 850 MHz and 700 MHz bands (about 120 MHz in all) with a much smaller amount of spectrum (14 MHz) in the 800 MHz Specialized Mobile Radio (SMR) band.

[11] Sprint will be able and plans to deploy 2x5 MHz LTE in its 800 MHz Nextel frequencies after the shutdown of the iDEN network, while T-Mobile now has access to 700 MHz lower band A block frequencies in one Economic Area in New England that it acquired with its merger with MetroPCS. In contrast AT&T and Verizon hold a combined 84% of the licensed 850 and 700 MHz spectrum on a MHz-POPs basis nationwide according to the FCC's "Sixteenth Annual Report on Competitive Market Conditions With Respect to Mobile Wireless, Including Commercial Mobile Services," (paragraph 129), http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-13-34A1.pdf

[12] *Ex Parte* Submission of the United States Department of Justice, http://apps.fcc.gov/ecfs/document/view?id=7022269624; Jonathan B. Baker, March 12, 2013 "Spectrum Auction Rules That Foster Mobile Wireless Competition," http://apps.fcc.gov/ecfs/document/view?id=7022130299

[13] Information Age Economics, "The Impact of Bidding Eligibility Conditions on Spectrum Auction Revenues," http://apps.fcc.gov/ecfs/document/view?id=7022122969

[14] 1. "Economists Submissions", http://apps.fcc.gov/ecfs/document/view?id=702242548: Prof. Michael L. Katz, Philip A. Haile, Dr. Mark A. Israel, and Dr. Andres V. Lerner, "Comments on the Submission of the U.S. Department of Justice Regarding Auction Participation Restrictions," *Policies Regarding Mobile Spectrum Holdings*, WT Docket No. 12-269 (June 13, 2013) ("Economist Response to DOJ") *and* Prof. Michael L. Katz, Philip A. Haile, Dr. Mark A. Israel, and Dr. Andres V. Lerner, "Comments on Appropriate Spectrum Aggregation Policy with Application to the Upcoming 600 MHz Auction," *Policies Regarding Mobile Spectrum Holdings,* WT Docket No. 12-269 (filed June 13, 2013) ("Auction Supplemental Reply") (attached to Letter from David L. Lawson (AT&T) to Marlene H. Dortch (FCC), GN Docket No. 12-268, WT Docket No. 12-269 (June 13, 2013); 2. Robert J. Shapiro, Douglas Holtz-Eakin and Coleman Bazelon,

also argues that low and high band frequencies are fully substitutable and economically equivalent in terms of the total costs of network deployment, so there is no basis for imposing band-specific limits on sub 1 GHz license aggregations.

IAE has already demonstrated that the second report in footnote 14, published by the McDonough School of Business at Georgetown University, is fundamentally flawed[15]. In this filing, on May 28, 2013, we also referred to our fruitless attempts to initiate a productive dialog with the authors of this report to develop a credible and practical measure of spectrum efficiency in place of the fatally flawed one used in their report.

Both of these filings fall into the trap of circularity by using a model of the market and competition that is like a spiral. The dynamics of this spiraling model move the market towards an inevitable outcome, given its inputs or starting point. The starting point is the unsupported assertion, backed up in the McDonough report by application of the spurious metric of spectrum efficiency discussed earlier, that the two largest U.S. operators now generate greater value from the spectrum they are using compared to other U.S. operators. Consequently, they should be allowed to acquire as much spectrum as they want -- and can -- because they will be able to generate more value from it than other licensees.

The inevitable outcome of this assertion and conclusion is the creation of a duopoly in order to maximize the future value that will operate within and for the U.S. economy. The FCC must consider carefully the implications and ramifications of this possible outcome.

Another study[16] attacking the DOJ's reasoning on spectrum aggregation makes a similar assumption acting on the basis that the four major U.S. wireless operators are selling a homogeneous, i.e., substitutable, service and therefore acting as "Cournot competitors" in which businesses compete on the quantity of their outputs. In this model of competition size, and ONLY size matters, which naturally tends to lead to a finding that the big should, and deserve to get, bigger. Therefore, any restraints on Verizon and AT&T to acquire additional resources (in this case the scarce publicly owned resource of spectrum) to expand these operators' outputs are unjustified, and harmful to the overall economy.

The simplistic logic implicit in these studies ignores all the other factors, in addition to spectrum, that contribute to the ways in which mobile operators can, and do, create value, as well as how other providers of services and applications create value, that depend on their conditions of essential customer ACCESS to wireless networks that are dominated by two powerful gatekeepers. These conditions involve many aspects independent of spectrum itself, such as third parties' ability to negotiate interconnection conditions and influence traffic management and pricing practices in a competitive negotiating environment (in contrast to a duopoly that can easily collude tacitly if not explicitly).

"The Economic Implications of Restricting Spectrum Purchases in the Incentive Auctions," http://apps.fcc.gov/ecfs/document/view?id=7022309583

[15] Information Age Economics," A Flawed Metric of Spectrum Efficiency," http://apps.fcc.gov/ecfs/document/view?id=7022418673

[16] George S. Ford and Lawrence J. Spiwak, Phoenix Center Policy Bulletin No 33, "EQUALIZING COMPETITION AMONG COMPETITORS:A REVIEW OF THE DOJ'S SPECTRUM SCREEN EX PARTE FILING," http://www.phoenix-center.org/PolicyBulletin/PCPB33Final.pdf

The Extraordinary Case of the "Economists Submissions"

The "Economists Submissions" included by AT&T in its Comments in this Docket are particularly egregious in their distortion and selective presentation of the facts and most notably apparent disregard of the basic costs and engineering of cellular networks that contradict their findings. The "facts" they cite are incorrect, and for other facts the practice in this work seems to be, "If the facts don't fit we just omit."

On page 6 of "Comments on the Submission of the U.S. DOJ Regarding Auction Participation Restrictions" the authors state (emphasis added):

"Here, this means that prices of different types of spectrum will adjust to ***equate the total costs of providing equivalent service*** *(i.e., the rights for spectrum requiring greater facilities investment will tend to sell for less than rights to spectrum requiring less facilities investment).* ***The equalization of total costs*** *renders the possibility of foreclosure through hoarding low-frequency spectrum alone remote at best."*

These statements are nonsensical, as can be shown easily with a calculation outlined in Appendix B. In the example presented in this Appendix a high band-only operator incurs an additional capital cost of $77-117 per capita (or POP) in a rural license area compared to an operator that also has access to low band frequencies. The high band-only operator also incurs higher **annual** operating expenses than an operator with a sub 1 GHz network deployment that amount to between $12.60-18.60 per capita.

The substantial additional financial costs incurred by high band-only operators are the inescapable consequence of the much greater number of cell sites that are required to cover a rural license area in high band compared to low band network deployments. The assertion of the ***total cost equivalency*** of high and low band frequencies for network deployments (and operation) in coverage-limited rural areas on the basis that higher spectrum license costs at low bands compensate for other lower costs in low band deployments is ludicrous, as all cellular network planners (of which there are many employed by Verizon and AT&T and their equipment suppliers) are aware.

We would welcome the opportunity to work with wireless operators that have been suffering from the oppressive, exclusionary and anti-competitive practices of Verizon and AT&T to develop multiple quantitative fact-based examples from their own footprints to demonstrate to the FCC, Department of Justice and other policy and regulatory stakeholders that it is vital that they have access to reasonable amounts of sub 1 GHz frequencies. This outcome will only be achieved if the two largest operators with much greater financial resources that they can expend to acquire additional sub 1 GHz spectrum are restricted from potentially acquiring all new sub 1 GHz spectrum that becomes available. Otherwise any other operator will be increasingly unable to compete with the two largest U.S. operators on a level playing field.

Even more damaging to the thesis of the "Economists Submissions" about ***total cost equivalency*** between high and low bands, and indeed to its entire credibility, is the omission of any mention of the cost of spectrum in the 850 MHz band, over three quarters of which is in the hands of Verizon and AT&T. As noted in Appendix B, the cost of 850 MHz spectrum licenses to

AT&T and to Verizon is zero. For this significant proportion of Verizon's and AT&T's sub 1 GHz spectrum holdings there are no compensating higher spectrum license costs that they have to bear compared to the costs of licenses in high bands.

Broadband HSPA systems have already been deployed in some 850 MHz frequencies and relatively soon this band will also become open for LTE deployments. LTE equipment and devices are already available at 850 MHz (for example the iPhone 5 model for AT&T includes 850 MHz capability) and AT&T has announced the shutdown of its GSM 2G networks by 2017 that will free all of its 850 MHz licenses for the deployment of mobile broadband systems[17].

In another disturbing example of the flawed work presented in the "Economists Submissions" the authors refer to a quote from T-Mobile on the same page 6 as follows:

"*Indeed, T-Mobile has publicly contradicted the Division's assertion that low-frequency spectrum is an essential input by stating that high- frequency spectrum is "as effective, or preferred to, lower band spectrum in providing competitive services."*[18]

However, the full paragraph in this letter showing the phrase presented selectively (it is bolded for this purpose) was:

"Although a mixture of lower and upper band spectrum is optimal for building competitive high speed mobile broadband networks, making more spectrum available in the lower bands would be especially effective in promoting competition in the wireless marketplace, as T-Mobile has described in past filings before the Commission. There are certain circumstances where upper band spectrum is ***as effective as, or preferred to, lower band spectrum in providing competitive services****, particularly for enhancing capacity in highly populated areas. As noted above, however, lower band spectrum provides a variety of critical spectral advantages that are not available from spectrum in the upper bands."*

This highly selective quote – a fragment of a sentence – is designed to create an impression of a statement made by T-Mobile as having a meaning that is the opposite of the obvious intent of the passage from which it is extracted. It is charitable to characterize the use of this deceptive tactic by the authors of these studies as disingenuous. Its use violates the basic evidentiary standards required of work to qualify as credible academic research or reliable professional analysis.

The second study "Comments on Appropriate Spectrum Aggregation Policy with Application to the Upcoming 600 MHz Auction," contains more evidence of the lack of understanding of wireless infrastructure economics by these authors addressed in their "Economists Submissions". They refer to the auction of 800 and 2500/2600 MHz spectrum, carried out in the U.K. early in 2013, in a statement on page 15:

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[17] "AT&T to Leave 2G Behind," http://online.wsj.com/article/SB10000872396390443687504577567313211264588.html

[18] Letter from T-Mobile USA to Secretary Dortch, Ex Parte, The State of Mobile Wireless Competition, WT Docket 10-133 (Dec. 2, 2010), page 2, http://apps.fcc.gov/ecfs/document/view?id=7020922097

"In fact, that auction has been completed and is viewed by many as a failure: It has generated less than two thirds of the revenue predicted based on outcomes in other countries and is now the subject of a National Audit Office inquiry. Although this is only a single observation from a different country, the U.K. experience may nonetheless provide the most useful insight on the likely revenue effects of imposing caps in the upcoming 600 MHz auction in the U.S."

This last remark displays a lack of awareness of all the factors -- which can be as or more important than the presence or absence of spectrum caps -- that affect the financial and other outcomes of spectrum auctions. IAE recognized and outlined the multi-dimensional dynamics of spectrum auctions in the analyses in its report "The Impact of Bidding Eligibility Conditions on Spectrum Auction Revenues" referenced in footnote 13 above.

Furthermore one auction covered in this IAE report provides a striking counter-example to the description of the U.K. auction as a "failure".[19] An auction in the Netherlands in late 2012 involved flexible set asides of two 2x5 MHz blocks at 800 MHz and one 2x5 MHz block at 900 MHz for newcomers; any newcomer was subject to a 2x10 MHz cap combined at 800 and 900 MHz. The Dutch regulator introduced flexibility into the set asides by allowing one or more, and even all of them, to be included in the pool of licenses for which all bidders were eligible, if there were no or insufficient bids in the auction from operators for whom these licenses were initially reserved[20]. The goal of this regulator was to enable market entrants to acquire enough low band frequencies for efficient LTE deployment in order to complement their earlier acquisitions of 2.5 GHz band licenses, and strengthen competition.

The outcome of the auction was that two existing operators (out of three) and one newcomer won 800 MHz licenses (2x10 MHz), while the third existing operator won 2x15 MHz at 900 MHz, including a 5 MHz block initially set aside for newcomers, once the second newcomer bidder had dropped out of the auction. Furthermore, in contrast to the U.K. auction, and with spectrum aggregation limits in place, the auction in the Netherlands raised much more than expected, with prices so high that market leader, KPN, said it would have to cut dividends to afford its licenses.[21]

These examples of the mistakes by the authors discredit the entire body of the "Economists Submissions", including their rebuttals of the findings and evidence presented in the filings of the Department of Justice and Professor Baker.

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[19] Even if the U.K. failed to deliver as much revenue to the U.K. Treasury as the Chancellor of the Exchequer hoped to help reduce the country's current fiscal deficit, it may turn out to have been a success in assigning new spectrum to operators at reasonable prices that will enable them to deploy new network capacity that creates substantial value in the medium-and-long-term. Success, like beauty, can be in the eye of the beholder, who in the case of spectrum should have a long range and wide vision, not a narrow short-term focus on immediate gratification from one-time license payments.

[20] A similar approach might be applied to spectrum aggregation limits in the U.S. Incentive Auctions, as proposed (a Dynamic Market Rule) by T-Mobile in a recent filing in Docket 12-268, http://apps.fcc.gov/ecfs/document/view?id=7520924252

[21] "Dutch 4G frequency auction raises more than expected," http://www.reuters.com/article/2012/12/15/us-dutch-telco-auction-idUSBRE8BE00020121215

It is disturbing that AT&T should rely on outside contributors to support its positions on key issues affecting the U.S. mobile sector who apparently lack a basic understanding of the economic facts and implications of cellular technology, or an ability to draw credible lessons from foreign experiences and comparisons. AT&T employs many talented and qualified people who have this understanding. AT&T's Bell Labs originally proposed the concept of cellular technology in the late 1940s. Yet apparently AT&T's review process of the findings produced in the external studies it commissions is either non-existent or fails to catch and correct errors of fact.

Conclusion

Two key aspects of spectrum policy with regard to allocations and assignments are critical influences on the current and future state of competition in the U.S. CMWS market. Effective competition in this market is impaired and is moving along a path towards further erosion. There is a risk that an irreversible, anti-competitive, customer-hostile, monopoly rent-seeking duopoly will become established as a consequence of the initiatives of the two largest operators with respect to:

- Non-interoperability in the rapidly growing LTE environment that these two operators, the initiators and only champions of non-interoperability, plan to expand broadly and soon, with the introduction of carrier aggregation and LTE-only devices.
- The acquisition, using their superior financial resources, of as much additional spectrum as they can, effectively foreclosing its use to others (even in terms of allowing roaming under reasonable and fair conditions) all the while arguing that there should be no restrictions on the amounts of spectrum that they can "buy and hold".

Furthermore, Verizon and AT&T exhibit indifference to facts and evidence in the filings submitted to the FCC in support of their claims and assertions with respect to critical spectrum issues. They and the authors of studies that they commission and fund in order to support their positions have persistently ignored conclusive proof of substantial errors of commission and omission in their analyses. They have not even acknowledged these errors. On the contrary, they have persisted in presenting findings that have been shown repeatedly and conclusively to be fundamentally flawed, notably:

- Their comparisons of spectrum efficiency between operators and countries that purport to show the superiority of the U.S. and their own performance;
- Their denial of the clear economic advantage of low band frequencies for deployments in rural areas;
- Their counter-factual assertions of the superior performance of the U.S. CMWS market compared to other countries, and
- Their rejection of the significance of high concentrations of spectrum holdings (overall and in sub 1 GHz bands) in the hands of one or two operators, which, if allowed to increase too far, become a threat to effective market competition that has been clearly identified and is being actively addressed in many other countries[22].

[22] A very recent example of concerns about the competitive impact of high concentrations of spectrum holdings -- overall and by band -- is found in Industry Canada's "Framework Relating to Transfers,

This pattern of a combination of presenting errors of fact and omitting critical items of evidence is found at the highest levels of Verizon and AT&T. For example, by his presence at *ex parte* meetings at the FCC on June 13, 2013[23] AT&T's CEO endorsed the findings of the study commissioned by AT&T ("Economists Submissions") whose fundamental errors and flaws have been exposed in this document. In an op-ed in the New York Times on June 20, 2013[24] Verizon's CEO quoted the European Union official responsible for broadband policy, Neelie Kroes as saying in support of his contention about the superiority of the performance of the U.S. mobile market:

"Once, Europe led the world in wireless communication: now we have fallen behind. Europe needs to regain that lead."

Inconveniently for his thesis Neelie Kroes has also expressed an opinion about the U.S. market, which goes directly to the dominant roles of Verizon and AT&T, as follows:

"The American market is not perfect. The EU telecoms market may be too fragmented, but it is certainly competitive. In the States, an effective duopoly makes life hard for new entrants, if not impossible. And rules like equity caps or unequal access to spectrum and networks are outdated, and have no place in a truly open market."[25]

So apparently the Vice President of the European Commission selectively quoted by Verizon's CEO to support his claim that the U.S. has "Got Broadband Right" does not believe that the U.S. market is effectively competitive or represents a market model worthy of emulation.

A comprehensive and independent analysis of the wireless sector by the legal, technical and economic staff of the FCC is needed in order to establish a comprehensive, objective, and fact-driven base for a determination of the true state of competition in the U.S. CMWS market, and its likely evolution over the next few years in order to ensure that healthy competition is sustained for the benefit of the American public.

Divisions and Subordinate Licensing of Spectrum Licences for Commercial Mobile Spectrum," p.7-8, http://www.ic.gc.ca/eic/site/smt-gst.nsf/vwapj/dgso-003-13-transfer.pdf/$file/dgso-003-13-transfer.pdf

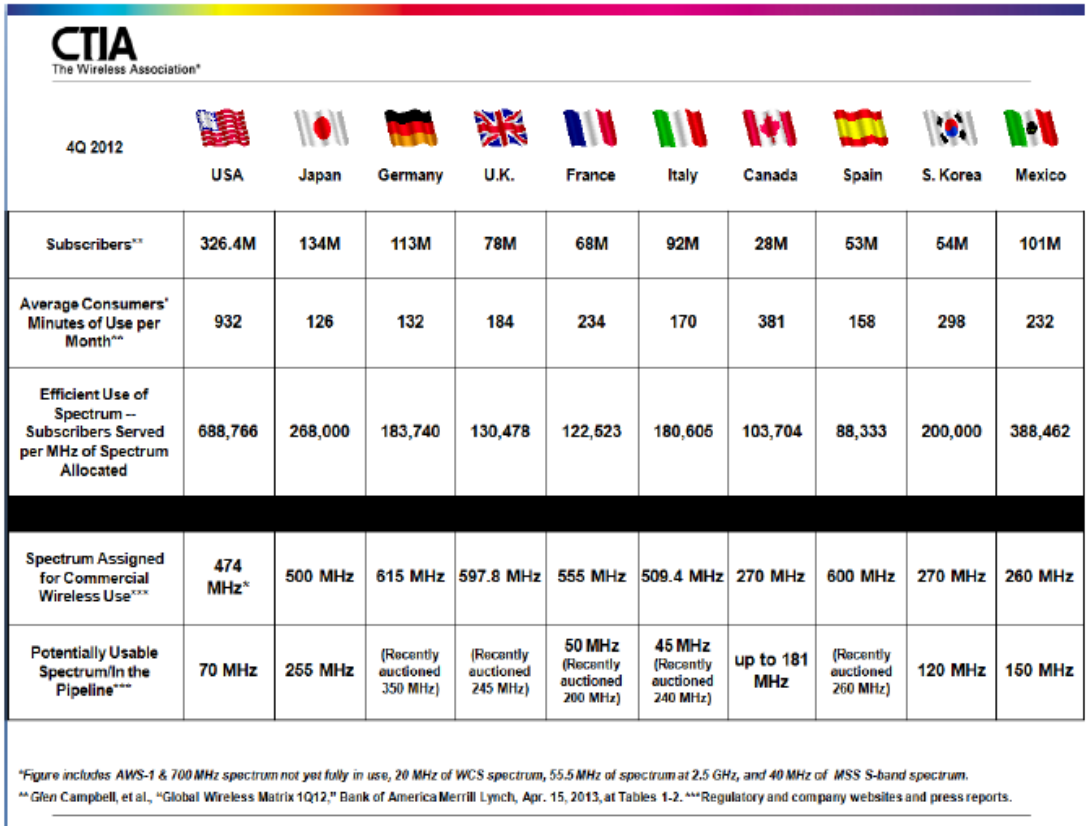
[23] http://apps.fcc.gov/ecfs/document/view?id=7022425569; http://apps.fcc.gov/ecfs/document/view?id=7022425554; http://apps.fcc.gov/ecfs/document/view?id=7022425543

[24] Lowell McAdam, "How the US Got Broadband Right," http://www.nytimes.com/2013/06/21/opinion/how-the-us-got-broadband-right.html?_r=0

[25] http://www.fiercewireless.com/europe/story/fascinating-europe-gets-boost-ma-rumours/2013-06-21

Appendix A: A Spurious Metric of Spectrum Efficiency: The CTIA's Flag Chart

Source: Comments of CTIA, http://apps.fcc.gov/ecfs/document/view?id=7520920372



CTIA
The Wireless Association®

4Q 2012	USA	Japan	Germany	U.K.	France	Italy	Canada	Spain	S. Korea	Mexico
Subscribers**	326.4M	134M	113M	78M	68M	92M	28M	53M	54M	101M
Average Consumers' Minutes of Use per Month^^	932	126	132	184	234	170	381	158	298	232
Efficient Use of Spectrum -- Subscribers Served per MHz of Spectrum Allocated	688,766	268,000	183,740	130,478	122,523	180,606	103,704	88,333	200,000	388,462
Spectrum Assigned for Commercial Wireless Use***	474 MHz*	500 MHz	615 MHz	597.8 MHz	555 MHz	509.4 MHz	270 MHz	600 MHz	270 MHz	260 MHz
Potentially Usable Spectrum/In the Pipeline****	70 MHz	255 MHz	(Recently auctioned 350 MHz)	(Recently auctioned 245 MHz)	50 MHz (Recently auctioned 200 MHz)	45 MHz (Recently auctioned 240 MHz)	up to 181 MHz	(Recently auctioned 260 MHz)	120 MHz	150 MHz

*Figure includes AWS-1 & 700 MHz spectrum not yet fully in use, 20 MHz of WCS spectrum, 55.5 MHz of spectrum at 2.5 GHz, and 40 MHz of MSS S-band spectrum.
** Glen Campbell, et al., "Global Wireless Matrix 1Q12," Bank of America Merrill Lynch, Apr. 15, 2013, at Tables 1-2. ***Regulatory and company websites and press reports.

Surprising information from the CTIA:

- Mexican operators are 3.7 times more efficient than Canadian and 45% more efficient than Japanese operators.
- South Korean operators are only 29% as efficient as U.S. operators.
- Operators in Deutsche Telekom's home market Germany are only 27% as efficient as operators in the market in which its subsidiary T-Mobile USA operates.
- Operators in Vodafone's home market in the U.K. are only 19% as efficient as operators in the market in which its partnership with Verizon Wireless is active.

Appendix B: Frequency Dependence of the Total Costs of Rural Coverage

Suppose that one operator covers a rural area with a 2x10 MHz LTE deployment in the 700 MHz band. A representative price for a 700 MHz license in rural areas is $0.35 per MHz-POP. If 50,000 POPs live in the area then the cost of the 700 MHz license works out to $350,000. Now suppose another operator has to cover the same area with high frequency spectrum, say 1900 or 2500 MHz. We assume that the high band license has zero cost in order conservatively to

maximize the additional cost burden the low band operator has to overcome because of the relatively high prices of low band licenses for the purposes of this assessment.

At the average population density in rural areas in the U.S. of 18 POPs per square mile, 50,000 POPs would occupy an area of just under 2800 square miles. Coverage of this area at 700 MHz with a cell radius of 10 miles might require 9 cell sites, whereas coverage at 1900 and 2500 MHz might require 30 cells and 40 cells respectively, i.e. 21 and 31 more than in the 700 MHz deployment.

The costs of wireless base stations vary widely. A major factor in the variation is the cost of any towers needed to support the antennas. Another significant cost is real estate. In this filing we use one set of illustrative costs.

We assume that the capital cost (capex) of a cell site is $200,000 and its annual operating expense (opex) is $30,000 or 15% of capex. Then in the example used here the capex disadvantage of the high band operator lies between $3.85 million to $5.85 million or $77-117 per capita (or POP) in the rural license area (based on total base station capex minus the higher lower band spectrum cost) while its opex disadvantage lies between $630,000-930,000, or $12.60-18.60 annually per capita.

Furthermore, once the initial cost of the low band license has been fully depreciated, the low band operator will not suffer any spectrum-related cost disadvantage compared to the high band operator, since in practice these licenses are renewed at no cost. Besides the costs of the significant 850 MHz licenses held by Verizon and AT&T that comprise a significant proportion of their current sub 1 GHz spectrum holdings are already zero.

The actual capital and operating cost disadvantages per capita or per customer of a high band-only compared to a low and high band operator will vary widely between different license areas in the U.S. that vary in terms of their sizes, shapes, topographies and the distributions of their populations and economic activities as well as their traffic patterns. However the basic economics of spectrum licenses and the factors driving the frequency dependence of the costs of coverage-limited network deployments are the same across the country. An assessment of the total economic handicap suffered by a high band-only operator in providing national coverage compared to an operator with access to a portfolio of high and low band frequencies requires more comprehensive and detailed analyses than we have presented in this Appendix.